



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/994,142

11/26/2001

Meijie Zhang

P24,841-A USA

9602

7590 02/23/2007  
Synnestvedt & Lechner LLP  
2600 Aramark Tower  
1101 Market Street  
Philadelphia, PA 19107-2950

EXAMINER

DOVE, TRACY MAE

ART UNIT

PAPER NUMBER

1745

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
--	-----------	---------------

3 MONTHS

02/23/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

09/994,142

Applicant(s)

ZHANG, MEIJIE

Examiner

Tracy Dove

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,7-13,27 and 31-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,7-13,27 and 31-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

This Office Action is in response to the communication filed on 1/4/07. Applicant's arguments have been considered, but are not persuasive. Claims 1, 7-13, 27 and 31-38 are pending. This Action is made FINAL, as necessitated by amendment.

#### ***Claims Analysis***

The term "LiCoO<sub>2</sub> type structure" in the claims is defined by the specification at page 3, lines 28-30. A "LiCoO<sub>2</sub> type structure" is defined as LiCoO<sub>2</sub> or LiNi<sub>x</sub>Co<sub>1-x</sub>O<sub>2</sub> ( $0 \leq x \leq 1$ ).

The specification recites the term "lithium borate" is used to refer to any lithium-boron-oxide compound (page 8, lines 1-2).

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 27 and 31-38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 recites "a lithium cathode-active material" while claim 31 recites "the cathode-active material is a lithium transition metal oxide cathode", which is indefinite. Examiner suggests amending claim 27 to recite "a lithium transition metal oxide cathode-active material" or "a lithium insertion compound cathode-active material".

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 1745

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 7-12, 27 and 31-37 are rejected under 35 U.S.C. 102(b)/103(a) as being anticipated by, and alternatively unpatentable over, Uehara et al., JP 09-330720 (a machine translation of the Japanese patent is attached).

Uehara teaches a lithium battery having a positive electrode including a lithium transition metal compound oxide, a negative electrode including a lithium material or a material capable of storing and releasing lithium ion, and a nonaqueous electrolyte. At least part of the particle surface of the lithium transition metal compound oxide is covered with a compound containing lithium and boron. Uehara teaches a lithium battery having reduced capacity fade rate (abstract). A multiple oxide containing lithium and boron such as  $\text{LiBO}_2$  or  $\text{Li}_2\text{B}_4\text{O}_7$  may be used to cover the lithium transition metal compound positive electrode material (0011). The coating compound is contained in an amount of 0.1-20% based on the lithium transition metal compound (0012). The lithium transition metal compound positive electrode material may be  $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$  (0032). The negative electrode material may be lithium, a lithium alloy (lithium compound anode) or a carbon material such as graphite (0016). The electrode includes an electrolyte salt such as  $\text{LiPF}_6$  and an organic solvent such as propylene carbonate, ethylene

Art Unit: 1745

carbonate, diethyl carbonate, dimethyl carbonate or mixtures thereof (0018-0019). Uehara teaches the lithium transition metal oxide and the lithium-boron-oxide containing compound are mixed and heated to a temperature of 650°C (0039 and 0044). The battery includes a separator 3, as shown in Figure 1. The compound  $\text{LiCoO}_2$  is encompassed by the general formula (1) disclosed by Uehara in paragraph 0014. Example 11 in Table 2 teaches  $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$  with a coating of 2 mol% of  $\text{LiBO}_2$  (approximately 1 wt% of  $\text{LiBO}_2$ ).

Uehara does not explicitly state the lithium borate is dispersed on the surface of the cathode active material by drying a mixture of said cathode active material in an aqueous solution of lithium borate at a temperature between 250-450°C. However, the aqueous solution and temperature limitations of the claimed invention are product-by-process limitations. The courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. See MPEP 2113. The heat treatment temperature of Uehara (650°C) is outside of the heat treatment temperature range of the claimed invention for an aqueous treatment (250°C to 450°C). However, the present invention teaches dry-mixing the cathode active material and lithium borate then heating at 600°C improved the capacity fade rate (Example IV, page 10). Uehara teaches a dry mixing method, not an aqueous method for mixing the cathode active material and lithium borate. The coated positive electrode material of Uehara and the coated positive electrode material of the claimed invention appear to be the same. Only limitations of the active cathode material contained in the claimed lithium battery will be given patentable weight unless evidence of unexpected results is provided. The evidence must distinguish the claimed invention over the prior art of record. See MPEP 2113. Specifically, whether the

Art Unit: 1745

lithium borate and lithium insertion compound are dry mixed or mixed in an aqueous solution, the coated lithium insertion compound, as an end result, appears to be the same.

»

Claims 13 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uehara et al., JP 09-330720 in view of Gosho et al., US 6,589,694.

Uehara teaches a lithium battery having a positive electrode including a lithium transition metal compound oxide, a negative electrode including a lithium material or a material capable of storing and releasing lithium ion, and a nonaqueous electrolyte. At least part of the particle surface of the lithium transition metal compound oxide is covered with a compound containing lithium and boron. Uehara teaches a lithium battery having reduced capacity fade rate (abstract). A multiple oxide containing lithium and boron such as  $\text{LiBO}_2$  or  $\text{Li}_2\text{B}_4\text{O}_7$  may be used to cover the lithium transition metal compound positive electrode material (0011). The coating compound is contained in an amount of 0.1-20% based on the lithium transition metal compound (0012). The lithium transition metal compound positive electrode material may be  $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$  (0032). The negative electrode material may be lithium, a lithium alloy or a carbon material such as graphite (0016). The electrode includes an electrolyte salt such as  $\text{LiPF}_6$  and an organic solvent such as propylene carbonate, ethylene carbonate, diethyl carbonate, dimethyl carbonate or mixtures thereof (0018-0019). Uehara teaches the lithium transition metal oxide and the lithium-boron-oxide containing compound are mixed and heated to a temperature of  $650^\circ\text{C}$  (0039 and 0044). The battery includes a separator 3, as shown in Figure 1. The compound  $\text{LiCoO}_2$  is encompassed by the general formula (1) disclosed by Uehara in paragraph

Art Unit: 1745

0014. Example 11 in Table 2 teaches  $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$  with a coating of 2 mol% of  $\text{LiBO}_2$  (approximately 1 wt% of  $\text{LiBO}_2$ ).

Uehara does not explicitly teach that the nonaqueous solvent is a mixture of ethylene carbonate (EC), propylene carbonate (PC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC) and dimethyl carbonate (DMC).

However, Goshō teaches lithium secondary battery having positive electrode including a lithium transition metal composite oxide active material, a negative electrode including a graphite active material and a nonaqueous electrolyte including a salt and a solvent (col. 8, lines 15-48). The lithium transition metal composite oxide is preferably a Li-Co type composite oxide, particularly preferably  $\text{LiCoO}_2$  (col. 6, lines 14-23). Table 9 discloses various nonaqueous electrolytes having an  $\text{LiPF}_6$  salt and a solvent mixture of EC, PC, DEC, EMC and DMC (Ex. 30-34, 36 and 37).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have been motivated to use the organic solvent mixture of Goshō for the organic solvent of Uehara in order to inhibit lowering of discharge capacity and intermediate voltage at low temperature. One of skill would have been motivated to adjust the mixing ratio of the components of the electrolyte solvent to improve low temperature characteristics of the battery (col. 31, lines 65-col. 32, lines 4). Uehara discloses using EC, PC, DEC and DMC as organic solvents for the electrolyte (only EMC is not disclosed by Uehara). One of skill would have been motivated to combine the teaching of Uehara and Goshō because both are directed toward lithium secondary batteries having lithium transition metal oxide positive electrodes and graphite negative electrode. Both references teach

Art Unit: 1745

nonaqueous electrolytes having a  $\text{LiPF}_6$  salt and a solvent containing cyclic and linear organic carbonate solvents.

***Response to Arguments***

Applicant's arguments filed 1/4/07 have been fully considered but they are not persuasive.

Applicant asserts the present invention provides unexpected results in view of Uehara. However, Applicant has not properly compared the claimed invention and the prior art. Specifically, Applicant is comparing the aqueous method recited by the claimed invention with the dry mixing method disclosed by Uehara. Applicant's own specification teaches dry mixing the cathode active material and lithium borate then heating at  $600^\circ\text{C}$  improved the capacity fade rate (Example IV, page 10). Furthermore, Uehara clearly teaches coating the surface of lithium transition metal oxide cathode active materials with lithium borate to improve the capacity fade rate. In order to show unexpected results, Applicant must show the aqueous mixed/heat treated material of the claimed invention provides unexpected results over the dry mixed/heat treated material of Uehara.

Applicant argues Uehara does not teach a lithium borate hydrate. Examiner points out that claims 1 and 27 recite "an aqueous solution of said lithium borate" (no hydrate required). Furthermore, this is a product-by-process limitation because the hydrate is not contained in the produced cathode active material.

Applicant asserts unexpected results are shown in Figure 5 of the present application. However, the results shown in Figure 5 are not commensurate in scope with the claimed invention. The results shown in Figure 5 are obtained for a specific amount (0.15%) of lithium.



Art Unit: 1745

borate. Claims 1 and 27 recites a broader range for the amount of lithium borate by weight of the cathode powder. Furthermore, unexpected results must distinguish the claimed invention over the prior art. Specifically, Applicant must show the *battery* of the claimed invention has improved capacity fade rate over the *battery* of the prior art.

The 35 U.S.C. 103(a) rejection in view of Uehara and Gosho is maintained. Applicant argues that neither Uehara nor Gosho teach the heating temperature of the claimed invention. However, the heating temperature is a product-by-process limitation. See arguments above regarding the Uehara reference.

### *Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 1745

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

February 21, 2007



TRACY DOVE  
PRIMARY EXAMINER